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GIOTTO DATA ANALYSIS: ELECTRON PLASMA AND HEAVY ION COMPOSITION MEASUREMENTS  
AT COMET HALLEY

NAGW-1298

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## **Final Report: NAGW-1298**

This investigation involved the analysis of electron plasma and heavy ion composition measurements made by the COPENIC (COmplete Positive ion, Electron, and Ram Negative Ion measurements near Comet Halley) plasma experiment during the close fly-by of Halley by the European Space Agency's Giotto spacecraft. The experiment provided measurements of the full 3-dimensional distribution of 10 eV-30 keV electrons, and mass analysis of cold cometary ions from 10-210 amu.

The COPENIC experiment was a collaborative effort of the Centre d'Etude Spatiale des Rayonnements, Toulouse, France; the Max Planck Institut für Aeronomie, Lindau, W. Germany; the University of California, Berkeley; and the University of California, San Diego. Professor Henri Rème of CESR, Toulouse, France, was the Principal Investigator for the overall experiment. Dr. R. P. Lin was the P.I. for the U.S. participation.

The analysis of the COPENIC data has yielded some remarkable results, including:

- The discovery of negatively charged ions in the inner coma.
- The discovery of far heavier (mass >50 amu) ions than predicted, dominated by complex molecular ions made up of C, H, O, and N.
- The discovery of an adiabatic heating effect on electrons from the compression of the solar wind plasma.
- The identification of several organic and sulfur bearing ions.
- The discovery of a new "mystery region" where electrons are accelerated to high energies.

These discoveries were in addition to the detailed analysis of "expected" features at Comet Halley. Although this grant has expired, analysis continues on the data at a low (unfunded) level, and it is expected that more significant results will be obtained.

A bibliography of the papers resulting from this research is attached, and a copy of each paper is included.

# Bibliography of Papers Resulting from Giotto Research Supported by NASA Contract NASW-3575 and Grant NAGW-1298

*R. P. Lin, Principal Investigator*

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